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Science and Technology for Tomorrow's Air and Space Force

Success Story

POLYURETHANE ELASTOMER COATING SHOWS PROMISE FOR STRENGTHENING BUILDINGS AGAINST TERRORIST EXPLOSIONS



A polyurethane elastomer coating applied to exterior walls will prevent blast fragments or pieces of the wall from penetrating the inside of Department of Defense (DoD) facilities where they can cause harm to personnel. Materials and Manufacturing Directorate researchers cannot harden some facilities in conventional ways due to economic or political restrictions. They expect the new coating process to overcome these restrictions, while providing significant cost savings, as compared to hardening a facility with thick concrete walls, reinforcing steel, and composite materials and fabrics.



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Accomplishment

Directorate engineers developed a coating for concrete block walls, common non-load bearing walls, and lightweight manufactured structures that provides additional protection for people inside during a terrorist explosion. The directorate's full-scale explosive testing on those structures coated with a polyurethane elastomer revealed that the samples expanded to twice their thickness, demonstrating that the elastomer coating will allow a concrete wall to flex, thus preventing blast fragments or pieces of the wall to penetrate the inside of a building.

Background

For more than 20 years, the DoD has faced the global threat of terrorists who cause injury and death to many innocent people and serious damage to important assets. In fact, in the last 15 years, 80% of the DoD's total casualties were the result of terrorist activities.

The directorate's Force Protection Branch, part of the Airbase Technologies Division at Tyndall Air Force Base, Florida, has an impressive record for developing effective methods of retrofitting existing structures to improve resistance to a blast. To better determine the mechanical properties of the elastomer, the engineers conducted several tests using only the elastomer and discovered it was, by itself, a highly effective alternative to the high-strength fabric retrofitting technique. Directorate engineers conducted several tests overseas as part of a joint international cooperative program.

As part of the test program, force protection engineers studied 25 commercially available polymers to determine their range of mechanical properties. Typically used in pickup truck bed liners, the lining for municipal water tanks, and in commercial food preparation areas, elastomers constitute a large commercial enterprise.

Of the 25 tested, directorate engineers found one product to yield the most favorable results and contain the desired range of properties needed for blast protection. The main benefits to the technology are the availability, and quickness and ease of application, which provide rapid response capabilities. The Air Force has released the technology to the engineering community to provide guidance for upgrading lightweight structures to protect people and facilities from explosive blasts.

Additional information

To receive more information about this or other activities in the Air Force Research Laboratory, contact TECH CONNECT, AFRL/XPTC, (800) 203-6451 and you will be directed to the appropriate laboratory expert. (03-ML-14)